What is claimed:

1. A dielectric thin film prepared from a precursor of a general structure (I):

$$\mathbf{Y\text{-}Z\text{-}Si(R'R'')\text{-}Ar\text{-}\{Si(R''''R''')\ \text{-}Z'\text{-}Y'\}_{n^{o}-1}} \qquad \mathbf{(I)}$$

wherein, Y and Y' are the same or different benzocyclobutane moieties;

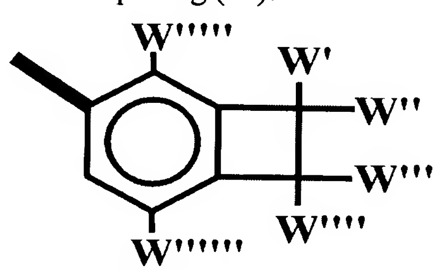
Z and Z' are the same or different, and individually a olefinic ("C=C") group, or an ethylenic ("C≡C") unsaturated carbon-carbon containing group;

R', R'', R''' and R'''' are the same or different, and individually a -F, a fluorinated alkyl group, or a fluorinated phenyl group;

Ar is an aromatic group moiety having a general structure: $-C_6H_{4-n}F_n$ -(n = 0 to 4); $C_6H_{4-n}F_n-CF_2-C_6H_{4-n}F_n-$ (n=0 to 8); $-C_{10}H_{6-n}F_n-$ (n=0 to 6) ;$-C_{12}H_{8-n}F_n-$ (n=0 to 8)$-C_{12}H_{8-n}F_n$;$-C_{14}H_{8-n}F_n$ - ;$-C_{16}H_{8-n}F_n$; $-C_{16}H_{10-n}F_n$ -; or –O-; and

n° is an integer of at least 1 but no more than a total number of sp^2C-H substitution on the fluorinated-aromatic-group-moiety.

2. The precursor of claim 1, wherein the benzoxyclobutane moiety has a general structure comprising (III):



(III)

wherein, W', W'', W''', W'''', W''''', and W'''''' are the same or individually a hydrogen, a fluorine or a fluorinated phenyl.

3. The thin film of claim 1, wherein a ratio of (sp^2C-F + sp^3C-F)/ ((sp^2C-F + sp^3C-F + sp^2C-H + sp^3C-H) substitutions should be at least 0.4, preferably 0.7

4. The thin film of claim 1, wherein the dielectric thin film has a dielectric constant ("ε") value equal to or less than 2.6.

5. The dielectric thin film of claim 1, wherein one or more layers of the thin film is deposited on an integrated circuit or electronic device.

6. The dielectric thin film of claim 5, wherein the electronic device comprises: an active matrix liquid crystal display, or a fiber optic device.

7. The dielectric thin film of claim 5, wherein the integrated circuit is manufactured via a dual damascene process comprising the dielectric thin film.

8. A dielectric thin film prepared from a precursor of a general structure (II):

$$\mathbf{Y\text{-}Z\text{-}C(X'X'')\text{-}Ar\text{-}\{C(X''''X''')\text{-}Z'\text{-}Y'\}_{n^{\circ}-1}} \qquad \mathbf{(II)}$$

wherein, Y and Y' are the same or different benzocyclobutane moieties;

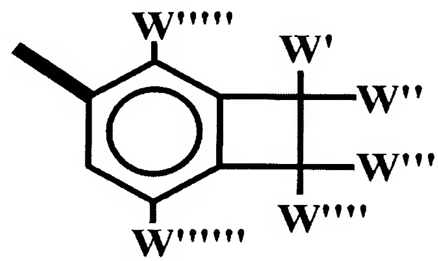
Z and Z' are the same or different, and individually a vinyl, olefinic ("C=C") group, or an ethylenic ("C≡C") unsaturated carbon-carbon containing group;

X', X'', X''' and X'''' are the same or different, and individually a fluorine, a fluorinated alkyl group, or a fluorinated phenyl group;

Ar is an aromatic group moiety having a general structure: $-C_6H_{4-n}F_n$ -(n = 0 to 4); $C_6H_{4-n}F_n$ $-CF_2$-$C_6H_{4-n}F_n$ – (n=0 to 8); $-C_{10}H_{6-n}F_n$ – (n=0 to 6);$-C_{12}H_{8-n}F_n$ – (n=0 to 8)$-C_{12}H_{8-n}F_n$;$-C_{14}H_{8-n}F_n$ - ;$-C_{16}H_{8-n}F_n$; $-C_{16}H_{10-n}F_n$ -; or –O-; and

n° is an integer of at least 2 but no more than a total number of sp^2C-H substitution on the fluorinated-aromatic-group-moiety.

9. The precursor of claim 8, wherein the benzoxyclobutane moiety has a general structure comprising:



(III)

wherein, W', W'', W''', W'''', W''''', and W'''''' are the same or individually a hydrogen, a fluorine or a fluorinated phenyl.

10. The dielectric thin film of claim 8, wherein a ratio of (sp^2C-F + sp^3C-F)/ ((sp^2C-F + sp^3C-F + sp^2C-H + sp^3C-H) substitutions should be at least 0.4,preferably 0.7

11. The dielectric thin film of claim 8, wherein the dielectric thin film has a dielectric constant ("ε") value equal to or less than 2.6.

12. The dielectric thin film of claim 8, wherein one or more layers of the thin film is deposited on an integrated circuit or electronic device.

13. The dielectric thin film of claim 12, wherein the electronic device comprises: an active matrix liquid crystal display, or a fiber optic device.

14. The dielectric thin film of claim 12, wherein the integrated circuit is manufactured via a dual damascene process comprising the dielectric thin film.

15. A method of making a dielectric thin film material, comprising:

(a) dissolving or suspending a precursor of claim 1 or claim 8 in a solvent to give a solution or suspension of the precursor in the solvent;

(b) spinning the solution or the suspension of the precursor in the solvent onto a substrate to form a thin wet film;

(c) heating the thin wet film to a temperature that is below a boiling-temperature of the solvent to remove most of the solvent from the thin wet film to form a thin dried film; and

(d) heating the thin dried film to a temperature that is below a glass-transition temperature of the thin dried film to give the dielectric thin film material

16. The method of claim 15 wherein, a rate of heating the wet film occurs at 3 to 5°C per minute to a maximum temperature that is below the boiling-temperature of the solvent.

17. The method of claim 15 wherein, the wet thin film is heated to a maximum temperature that ranges from 5 to 50°C below the boiling-temperature of the solvent.

18. The method of claim 17 wherein, a rate of heating the thin dried film occurs at 10°C per minute to a maximum temperature that is below the glass-transition temperature of the thin dried film.

19. The method of claim 17 wherein, the thin dried film is heated to a maximum temperature that ranges from 10 to 20°C below the glass-transition temperature of the thin dried film.